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ABSTRACT

The use of anabolic steroids is on the increase among athletes as well as other segments of the population. Data from the "Monitoring the Future" study showed a significant increase from 1998 to 1999 in steroid abuse among middle school students. During the same year, there was a decline in the percentage of 12th graders who believed that taking steroids was a health risk. Steroid abusers who share needles or use non-sterile techniques for injecting steroids are at risk for contracting infections such as HIV/AIDS, hepatitis B and C, and bacterial endocarditis. These and other effects of steroid abuse are discussed in this Research Report as well as the corresponding Community Drug Alert Bulletin. The objective is to keep communities up-to-date concerning the risks of abusing anabolic steroids and the science-based approaches to preventing and treating such abuse. (Contains 25 references.) (ADT)

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National Institute on Drug Abuse Research Report Series, April 2000 Anabolic Steroid Abuse

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NATIONAL INSTITUTE ON DRUG ABUSE

Research Report SERIES

ANABOLIC STEROID ABUSE

from the director

Since the 1950s, some athletes have been taking anabolic steroids to build muscle and boost their athletic performance. Increasingly, other segments of the population also have been taking these compounds. The Monitoring the Future study, which is an annual survey of drug abuse among adolescents across the country, showed a significant increase from 1998 to 1999 in steroid abuse among middle school students. During the same year, the percentage of 12th-graders who believed that taking these drugs causes "great risk" to health, declined from 68 percent to 62 percent.

Studies show that, over time, anabolic steroids can indeed take a heavy toll on a person's health. The abuse of oral or injectable steroids is associated with higher risks for heart attacks and strokes, and the abuse of most oral steroids is associated with increased risk for liver problems. Steroid abusers who share needles or use nonsterile techniques when they inject steroids are at risk for contracting dangerous infections, such as HIV/AIDS, hepatitis B and C, and bacterial endocarditis.

Anabolic steroid abuse can also cause undesirable body changes. These include breast development and genital shrinking in men, masculinization of the body in women, and acne and hair loss in both sexes.

These and other effects of steroid abuse are discussed in this Research Report, which is one of a series of reports on drugs of abuse. NIDA produces this series to increase understanding of drug abuse and addiction and the health effects associated with taking drugs. We hope that this compilation of scientific information on anabolic steroids will help the public recognize the risks of steroid abuse.

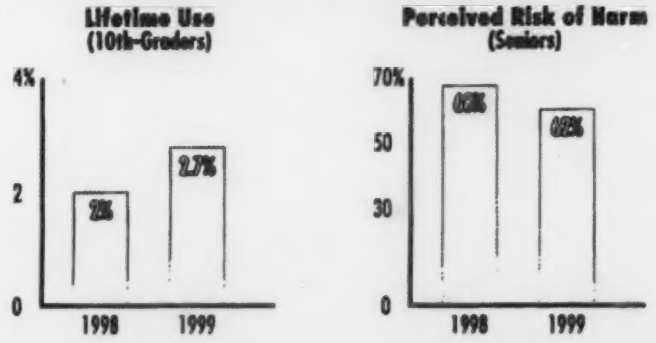
Alan I. Leshner, Ph.D.
Director
National Institute on Drug Abuse

What are anabolic steroids?

"Anabolic steroids" is the familiar name for synthetic substances related to the male sex hormones (androgens). They promote the growth of skeletal muscle (anabolic effects) and the development of male sexual characteristics (androgenic effects), and also have some other effects. The term "anabolic steroids" will be used throughout this report because of its familiarity, although the proper term for these compounds is "anabolic-androgenic" steroids.

Anabolic steroids were developed in the late 1930s primarily to treat hypogonadism, a condition in which the testes do not produce sufficient testosterone for normal growth, development, and sexual functioning. The primary medical uses of these

From 1998 to 1999, the Monitoring the Future Survey reported an increase in lifetime use of steroids among 10th-graders and a decrease in perceived risk of harm among seniors.



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compounds are to treat delayed puberty, some types of impotence, and wasting of the body caused by HIV infection or other diseases.

During the 1930s, scientists discovered that anabolic steroids could facilitate the growth of skeletal muscle in laboratory animals, which led to use of the compounds first by bodybuilders and weightlifters and then by athletes in other sports. Steroid abuse has become so widespread in athletics that it affects the outcome of sports contests.

More than 100 different anabolic steroids have been developed, but they require a prescription to be used legally in the United States. Most steroids that are used illegally are smuggled in from other countries, illegally diverted from U.S. pharmacies, or synthesized in clandestine laboratories.

What are steroidal supplements?

In the United States, supplements such as dehydroepiandrosterone (DHEA) and androstenedione (street name Andro) can be purchased legally without a prescription through many commercial sources including health food stores. They are often referred to as dietary supplements, although they are not food products. They are often taken because the user believes they have anabolic effects.

Steroidal supplements can be converted into testosterone (an important male sex hormone) or a similar compound in the body. Whether such conversion produces sufficient quantities of testosterone to promote muscle growth or whether the supplements themselves promote muscle growth is unknown. Little is known about the side effects of steroidal supplements, but if large quantities of these compounds substantially increase testosterone levels in the body, they also are likely to produce the same side effects as anabolic steroids.

Commonly Abused Steroids

Oral Steroids

- Anadrol (oxymetholone)
- Oxandrin (oxandrolone)
- Dianabol (methandrostenolone)
- Winstrol (stanozolol)

Injectable Steroids

- Deca-Durabolin (nandrolone decanoate)
- Durabolin (nandrolone phenpropionate)
- Depo-Testosterone (testosterone cypionate)
- Equipoise (boldenone undecylenate)

What is the scope of steroid abuse in the United States?

Recent evidence suggests that steroid abuse among adolescents is on the rise. The 1999 Monitoring the Future study, a NIDA-funded survey of drug abuse among adolescents in middle and high schools across the United States, estimated that 2.7 percent of 8th- and 10th-graders and 2.9 percent of 12th-graders had taken anabolic steroids at least once in their lives. For 10th-graders, that is a significant increase from 1998, when 2.0 percent of 10th-graders said they had taken anabolic steroids at least once. For all three grades, the 1999 levels represent a significant increase from 1991, the first year that data on steroid abuse were collected from the younger students. In that year, 1.9 percent of 8th-graders, 1.8 percent of 10th-graders, and 2.1 percent of 12th-graders reported that they had taken anabolic steroids at least once.

Few data exist on the extent of steroid abuse by adults. It has been estimated that hundreds of thousands of people aged 18 and older abuse anabolic steroids at least once a year.

Among both adolescents and adults, steroid abuse is higher among males than females. However, steroid abuse is growing most rapidly among young women.

Why do people abuse anabolic steroids?

One of the main reasons people give for abusing steroids is to improve their performance in sports. Among competitive bodybuilders, steroid abuse has been estimated to be very high. Among other athletes, the incidence of abuse probably varies depending on the specific sport.

Another reason people give for taking steroids is to increase their muscle size and/or reduce their body fat. This group includes some people who have a behavioral syndrome (muscle dysmorphia) in which a person has a distorted image of his or her body. Men with this condition think that they look small and weak, even if they are large and muscular. Similarly, women with the syndrome think that they look fat and flabby, even though they are actually lean and muscular.

Some people who abuse steroids to boost muscle size have experienced physical or sexual abuse. They are trying to increase their muscle size to protect themselves. In one series of interviews with male weightlifters, 25 percent who abused steroids reported memories of childhood physical or sexual abuse, compared with none who did not abuse steroids. In a study of women weightlifters, twice as many of those who had been raped reported using anabolic steroids and/or another purported muscle-building drug, compared to those who had not been raped. Moreover, almost all of those who had been raped reported that they markedly increased their bodybuilding activities after the attack. They believed that being bigger and stronger would discourage further attacks because men would find them either intimidating or unattractive.

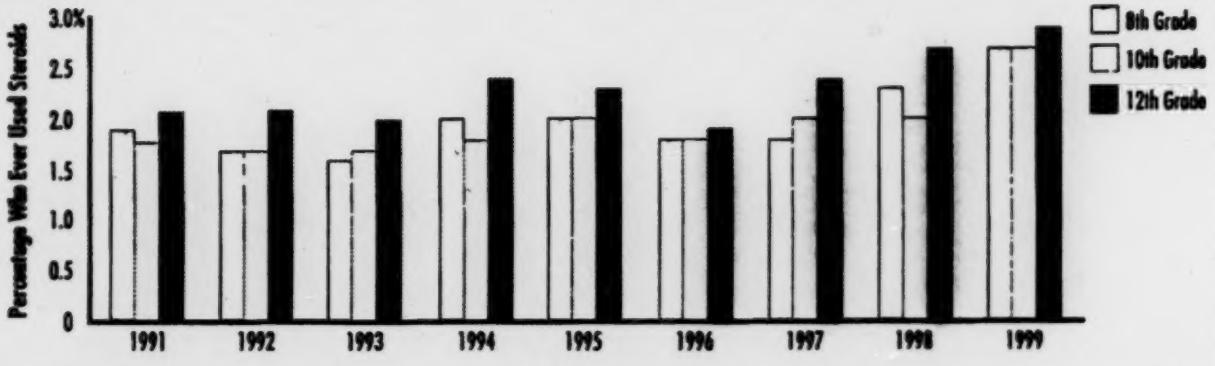
Finally, some adolescents abuse steroids as part of a pattern of high-risk behaviors. These adolescents also take risks such as drinking and driving, carrying a gun, not wearing a helmet on a motorcycle, and abusing other illicit drugs.

While conditions such as muscle dysmorphia, a history of physical or sexual abuse, or a history of engaging in high-risk behaviors may increase the risk of initiating or continuing steroid abuse, researchers agree that most steroid abusers are psychologically normal when they start abusing the drugs.

How are anabolic steroids used?

Some anabolic steroids are taken orally, others are injected intramuscularly, and still others are provided in gels

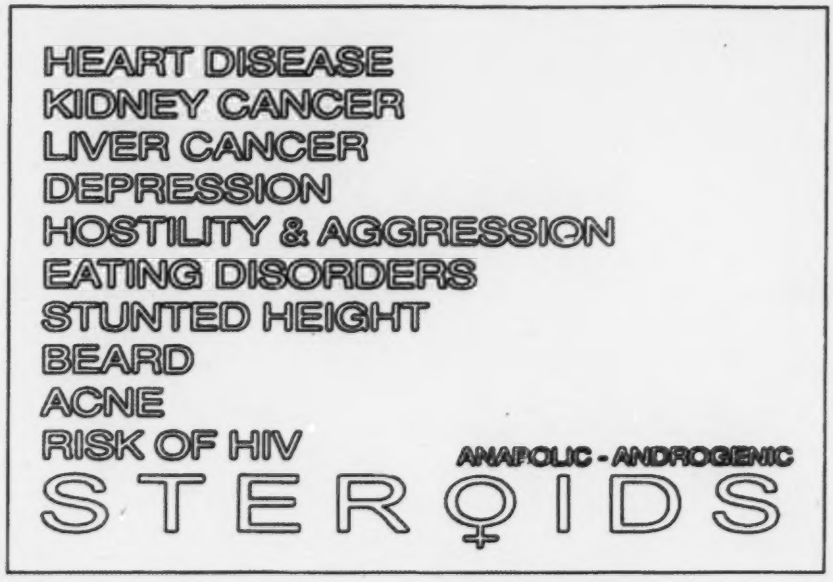
Lifetime Use of Steroids: 8th-Graders, 10th-Graders, and Seniors (1991-1999)



or creams that are rubbed on the skin. Doses taken by abusers can be 10 to 100 times higher than the doses used for medical conditions.

Steroid abusers typically "stack" the drugs, meaning that they take two or more different anabolic steroids, mixing oral and/or injectable types and sometimes even including compounds that are designed for veterinary use. Abusers think that the different steroids interact to produce an effect on muscle size that is greater than the effects of each drug individually, a theory that has not been tested scientifically.

Often, steroid abusers also "pyramid" their doses in cycles of 6 to 12 weeks. At the beginning of a cycle, the person starts with low doses of the drugs being stacked and then slowly increases the doses. In the second half of the cycle, the doses are slowly decreased to zero. This is sometimes followed by a second cycle in which the person continues to train but without drugs. Abusers believe that pyramiding allows the body time to adjust to the high doses and the drug-free cycle allows the body's hormonal system time to recuperate. As with stacking, the perceived benefits of pyramiding and cycling have not been substantiated scientifically.



What are the health consequences of steroid abuse?

Anabolic steroid abuse has been associated with a wide range of adverse side effects ranging from some that are physically unattractive, such as acne and breast development in men, to others that are life threatening, such as heart attacks and liver cancer. Most are reversible if the abuser stops taking the drugs, but some are permanent.

Most data on the long-term effects of anabolic steroids on humans come from case reports rather than formal epidemiological studies. From the case reports, the incidence of life-threatening effects appears to be low, but serious adverse effects may be under-recognized or under-reported. Data from animal studies seem to support this possibility. One study found that exposing male mice for one-fifth of their lifespan to steroid doses comparable to those taken by human athletes caused a high percentage of premature deaths.

Hormonal system

Steroid abuse disrupts the normal production of hormones in the body, causing both reversible and irreversible changes. Changes that can be reversed include reduced sperm production and shrinking of the testicles (testicular atrophy). Irreversible changes include male-pattern baldness and breast development (gynecomastia). In one study of male bodybuilders, more than half had testicular atrophy, and more than half had gynecomastia. Gynecomastia is thought to occur due to the disruption of normal hormone balance.

In the female body, anabolic steroids cause masculinization. Breast size and body fat decrease, the skin becomes coarse, the clitoris enlarges, and the voice deepens. Women may experience excessive growth of body hair but lose scalp hair. With continued administration of steroids, some of these effects are irreversible.

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Musculoskeletal system

Rising levels of testosterone and other sex hormones normally trigger the growth spurt that occurs during puberty and adolescence. Subsequently, when these hormones reach certain levels, they signal the bones to stop growing, locking a person into his or her maximum height. When a child or adolescent takes anabolic steroids, the resulting artificially high sex hormone levels can signal the bones to stop growing sooner than they normally would have done.

Cardiovascular system

Steroid abuse has been associated with cardiovascular diseases (CVD), including heart attacks and strokes, even in athletes younger than 30. Steroids contribute to the development of CVD, partly by changing the levels of lipoproteins that carry cholesterol in the blood. Steroids, particularly the oral types, increase the level of low-density lipoprotein (LDL) and decrease the level of high-density lipoprotein (HDL). High LDL and low HDL levels increase the risk of atherosclerosis, a condition in which fatty substances are deposited inside arteries and disrupt blood flow. If blood is prevented from reaching the heart, the result can be a heart attack. If blood is prevented from reaching the brain, the result can be a stroke.

Steroids also increase the risk that blood clots will form in blood vessels, potentially disrupting blood flow and damaging the heart muscle so that it does not pump blood effectively.

Liver

Steroid abuse has been associated with liver tumors and a rare condition called peliosis hepatis, in which blood-filled cysts form in the liver. Both the tumors and the cysts sometimes rupture, causing internal bleeding.

Skin

Steroid abuse can cause acne, cysts, and oily hair and skin.

Infection

Many abusers who inject anabolic steroids use nonsterile injection techniques or share contaminated needles with other abusers. In addition, some steroid preparations are manufactured illegally under nonsterile conditions. These factors put abusers at risk for acquiring life-threatening viral infections, such as HIV and hepatitis B and C. Abusers also can develop infective endocarditis, a bacterial illness that causes a potentially fatal inflammation of the inner lining of the heart. Bacterial infections also can cause pain and abscess formation at injection sites.

What effects do anabolic steroids have on behavior?

Case reports and small studies indicate that anabolic steroids, particularly in high doses, increase irritability and aggression. Some steroid abusers report that they have committed

Possible Health Consequences of Anabolic Steroid Abuse

Hormonal system
- ☐ men
  - ○ infertility
  - ○ breast development
  - ○ shrinking of the testicles
- ☐ women
  - ○ enlargement of the clitoris
  - ○ excessive growth of body hair
- ☐ both sexes
  - ○ male-pattern baldness

Musculoskeletal system
- ☐ short stature
- ☐ tendon rupture

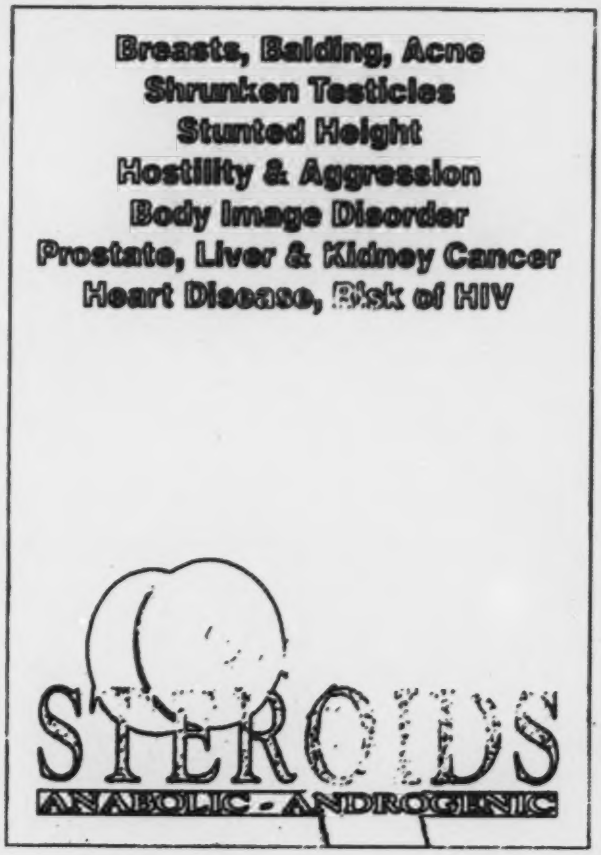
Cardiovascular system
- ☐ heart attacks
- ☐ enlargement of the heart's left ventricle

Liver
- ☐ cancer
- ☐ peliosis hepatis

Skin
- ☐ acne and cysts
- ☐ oily scalp

Infection
- ☐ HIV/AIDS
- ☐ hepatitis

Psychiatric effects
- ☐ homicidal rage
- ☐ mania
- ☐ delusions



aggressive acts, such as physical fighting, committing armed robbery, or using force to obtain something. Some abusers also report that they have committed property crimes, such as stealing from a store, damaging or destroying others' property, or breaking into a house or a building. Abusers who have committed aggressive acts or property crimes generally report that they engage in these behaviors more often when they take steroids than when they are drug-free.

Some researchers have suggested that steroid abusers may commit aggressive acts and property crimes not because of steroids' direct effects on the brain but because the abusers have been affected by extensive media attention to the link between steroids and aggression. According to this theory, the abusers are using this possible link as an excuse to commit aggressive acts and property crimes.

One way to distinguish between these two possibilities is to administer either high steroid doses or placebo for days or weeks to human volunteers and then ask the people to report on their behavioral symptoms. To date, four such studies have been conducted. In three, high steroid doses did produce greater feelings of irritability and aggression than did placebo; but in one study, the drugs did not have that effect. One possible explanation, according to researchers, is that some but not all anabolic steroids increase irritability and aggression.

Anabolic steroids have been reported also to cause other behavioral effects, including euphoria, increased energy, sexual arousal, mood swings, distractibility, forgetfulness, and confusion. In the studies in which researchers administered high steroid doses to volunteers, a minority of the volunteers developed behavioral symptoms that were so extreme as to disrupt their ability to function in their jobs or in society. In a few cases, the volunteers' behavior presented a threat to themselves and others.

In summary, the extent to which steroid abuse contributes to violence and behavioral disorders is unknown. As with the health complications of steroid abuse, the prevalence of extreme cases of violence and behavioral disorders seems to be low, but it may be underreported or underrecognized.

Are anabolic steroids addictive?

An undetermined percentage of steroid abusers become addicted to the drugs, as evidenced by their continuing to take steroids in spite of physical problems, negative effects on social relations, or nervousness and irritability. Also, they spend large amounts of time and money obtaining the drugs and experience withdrawal symptoms such as mood swings, fatigue, restlessness, loss of appetite, insomnia, reduced sex drive, and the desire to take more steroids. The most dangerous of the withdrawal symptoms is depression, because it sometimes leads to suicide attempts. Untreated, some depressive symptoms associated with anabolic steroid withdrawal have been known to persist for a year or more after the abuser stops taking the drugs.

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What can be done to prevent steroid abuse?

Early attempts to prevent steroid abuse concentrated on drug testing and on educating students about the drugs' adverse effects. A few school districts test for abuse of illicit drugs, including steroids, and studies are currently under way to determine whether such testing reduces drug abuse.

Research on steroid educational programs has shown that simply teaching students about steroids' adverse effects does not convince adolescents that they personally can be adversely affected. Nor does such instruction discourage young people from taking steroids in the future. Presenting both the risks and benefits of anabolic steroid use is more effective in convincing adolescents about steroids' negative effects, apparently because the students find a balanced approach more credible and less biased, according to the researchers. However, the balanced approach still does not discourage adolescents from abusing steroids.

A more sophisticated approach has shown promise for preventing steroid abuse among players on high school sports teams. In the ATLAS program, developed for male football players, coaches and team leaders discuss the potential effects of anabolic steroids and other illicit drugs on immediate sports performance, and they teach how to refuse offers of drugs. They also discuss how strength training and proper nutrition can help adolescents build their bodies without the use of steroids. Later, special trainers teach the players proper weightlifting techniques. An ongoing series of studies has shown that this multicomponent, team-centered approach reduces new steroid abuse by 50 percent. A program designed for adolescent girls on sports teams, patterned after the program designed for boys, is currently being tested.

What treatments are effective for anabolic steroid abuse?

Few studies of treatments for anabolic steroid abuse have been conducted. Current knowledge is based largely on the experiences of a small number of physicians who have worked with patients undergoing steroid withdrawal. The physicians have found that supportive therapy is sufficient in some cases. Patients are educated about what they may experience during withdrawal and are evaluated for suicidal thoughts. If symptoms are severe or prolonged, medications or hospitalization may be needed.

Some medications that have been used for treating steroid withdrawal restore the hormonal system after its disruption by steroid abuse. Other medications target specific withdrawal symptoms—for example, antidepressants to treat depression, and analgesics for headaches and muscle and joint pains.

Some patients require assistance beyond simple treatment of withdrawal symptoms and are treated with behavioral therapies.

Where can I get further scientific information about steroid abuse?

Fact sheets on anabolic steroids, other illicit drugs, and related topics can be ordered free, in English and Spanish, by calling NIDA Infofax at 1-888-NIH-NIDA (1-888-644-6432) or, for those with hearing impairment, 1-888-TTY-NIDA (1-888-889-6432).

Information on steroid abuse also can be accessed through the NIDA Steroid Abuse Web Site (www.steroidabuse.org). Information on illicit drugs in general can be accessed through NIDA's home page (www.drugabuse.gov) or by contacting the National Clearinghouse for Alcohol and Drug Information (NCADI) Web Site (www.health.org).

NIDA Web Sites
www.drugabuse.gov
www.steroidabuse.org

NCADI
Web Site: www.health.org
PHONE: 1-800-729-6686

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Glossary

Addiction: A chronic, relapsing disease, characterized by compulsive drug-seeking and abuse and by long-lasting chemical changes in the brain.

Anabolic effects: Drug-induced growth or thickening of the body's nonreproductive tract tissues—including skeletal muscle, bones, the larynx, and vocal cords—and decrease in body fat.

Analgesics: A group of medications that reduce pain.

Androgenic effects: A drug's effects upon the growth of the male reproductive tract and the development of male secondary sexual characteristics.

Antidepressants: A group of medications used in treating depressive disorders.

Cardiovascular system: The heart and blood vessels.

Hormone: A chemical substance formed in glands in the body and carried in the blood to organs and tissues, where it influences function, structure, and behavior.

Musculoskeletal system: The muscles, bones, tendons, and ligaments.

Placebo: An inactive substance, used in experiments to distinguish between actual drug effects and effects that are expected by the volunteers in the experiments.

Sex hormones: Hormones that are found in higher quantities in one sex than in the other. Male sex hormones are the androgens, which include testosterone; and the female sex hormones are the estrogens and progesterone.

Withdrawal: Symptoms that occur after chronic use of a drug is reduced or stopped.

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NIDA
NATIONAL INSTITUTE ON DRUG ABUSE

COMMUNITY DRUG ALERT BULLETIN

National Institute on Drug Abuse

6001 Executive Blvd.
Bethesda, MD 20892

April 2000

Dear Colleague,

Since the 1950s, some athletes have taken anabolic steroids to build muscles and boost their athletic performance. Increasingly, other segments of the population also have been taking these synthetic substances. The Monitoring the Future study, an annual survey of drug abuse among middle and high school students across the country, showed a significant increase from 1998 to 1999 in anabolic steroid abuse among middle schoolers. During the same year, the percentage of 12th-graders who believed that taking these drugs causes "great risk" to health declined from 68 percent to 62 percent.

Anabolic Steroids

Studies show that, over time, anabolic steroids can indeed take a heavy toll on a person's health. Abuse of oral or injectable anabolic steroids is associated with increased risk for heart attacks and strokes, and the abuse of most oral anabolic steroids is associated with increased risk for severe liver problems, including hepatic cancer. People who share needles or use nonsterile injection techniques put themselves at risk for contracting dangerous infections, such as HIV/AIDS, hepatitis B and C, and bacterial endocarditis.

Anabolic steroid abuse can also cause undesirable body changes. Men may develop enlarged breasts and women's bodies may become masculinized. Both sexes can develop acne and hair loss.

This Community Drug Alert Bulletin summarizes some of the latest scientific information on anabolic steroids. NIDA also has established a Web site to provide scientific information about anabolic steroids: *www.steroidabuse.org*. As research produces new information, NIDA will continue to make every effort to quickly disseminate these findings via the Web site and subsequent Alerts. Our objective is to keep the Nation's communities up-to-date concerning the risks of abusing anabolic steroids and science-based approaches to preventing and treating such abuse.

Sincerely

Alan I. Leshner, Ph.D.
Director
National Institute on Drug Abuse

U.S. Department of Health and Human Services

National Institutes of Health

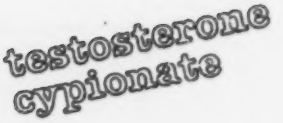
Anabolic Steroids

Anabolic steroids are...

- Synthetic substances related to the male sex hormones (androgens). They promote growth of skeletal muscle (anabolic effect) and the development of male sexual characteristics (androgenic effects), and also have other effects. (The term "anabolic steroids" will be used throughout this bulletin because of its familiarity, although the proper term for these compounds is "anabolic/androgenic" steroids.)
- Used by doctors to treat conditions that occur when the body produces abnormally low amounts of testosterone, such as delayed puberty and some types of impotence, and also to treat body wasting in patients with AIDS and other diseases.
- Legally available in the United States only by prescription. Anabolic steroid abusers obtain drugs that have been made in clandestine laboratories (sometimes with poor quality control standards), smuggled from other countries, or diverted illegally from U.S. pharmacies.
- Distinct from steroidal supplements. In the United States, supplements such as dehydroepiandrosterone (DHEA) and androstenedione (street name Andro) can be purchased legally without a prescription through many commercial sources including health food stores. They are often taken because the user believes they have anabolic effects.

Anabolic steroid abuse is...

- Increasing among adolescents, and most rapidly among females. The 1999 Monitoring the Future study, a NIDA-funded survey of drug abuse among middle school and high school students across the United States, recorded that 2.7 percent of 8th-graders, 2.7 percent of 10th-graders, and 2.9 percent of 12th-graders reported having taken anabolic steroids at least once in their lives. These figures represent increases since 1991 of approximately 50 percent among 8th- and 10th-graders and 38 percent among 12th-graders.
- Probably widespread among athletes and would-be sports competitors at all levels, although few data are available to provide exact estimates of prevalence. Many anabolic steroid abusers are unwilling to report the practice, because the International Olympic Committee and many other amateur and professional sports organizations have banned anabolic steroids.
- Motivated in most cases by a desire to build muscles and improve sports performance. Some individuals are motivated by erroneous perceptions of their own bodies (that is, a mistaken belief that they look underweight or obese) and others by a desire to prevent recurrence of physical or sexual attacks they have experienced.



Anabolic steroids are taken...

- Orally as tablets or capsules (Anadrol® [oxymetholone], Oxandrin® [oxandrolone], Dianabol® [methandrostenolone], Winstrol® [stanozolol], and others); by injection into muscles (Deca-Durabolin® [nandrolone decanoate], Durabolin® [nandrolone phenpropionate], Depo-Testosterone® [testosterone cypionate], Equipoise® [boldenone undecylenate], and others); or as ointment preparations rubbed into the skin. Doses taken by abusers can be up to 100 times more than the doses used for treating medical conditions.
- In combinations, a practice called "stacking." Abusers frequently take two or more anabolic steroids together, mixing oral and/or injectable types, sometimes adding drugs

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Steroid abusers often do not realize that over time, these drugs can take a heavy toll on their health.

such as stimulants or painkillers. The rationale for stacking is a belief—which has not been tested by science—that the different drugs interact to produce a greater effect on muscle size than could be obtained by simply increasing the dose of a single drug.

- In cyclic dosage regimens, a practice called "pyramiding." At the beginning of a cycle, the person starts with low doses of the stacked substances and then gradually increases the doses for 6 to 12 weeks. In the second half of the cycle, the doses are slowly decreased to zero. This is sometimes followed by a second cycle during which the person continues to train, but without drugs. Abusers believe that pyramiding allows the body time to adjust to the high doses, and the drug-free cycle allows time for the body's hormonal system to recuperate. As with stacking, the perceived benefits of pyramiding have not been substantiated scientifically.

Health consequences associated with anabolic steroid abuse include...

- *In boys and men*, reduced sperm production, shrinking of the testicles, impotence, difficulty or pain in urinating, baldness, and irreversible breast enlargement (gynecomastia).
- *In girls and women*, development of more masculine characteristics, such as decreased body fat and breast size, deepening of the voice, excessive growth of body hair, and loss of scalp hair, as well as clitoral enlargement.
- *In adolescents of both sexes*, premature termination of the adolescent growth spurt, so that for the rest of their lives, abusers remain shorter than they would have been without the drugs.
- *In males and females of all ages*, potentially fatal liver cysts and liver cancer; blood clotting, cholesterol changes, and hypertension, each of which can promote heart attack and stroke; and acne. Although not all scientists agree, some interpret available evidence to show that anabolic steroid abuse—particularly in high doses—promotes aggression that can manifest itself as fighting, physical and sexual abuse, armed robbery, and property crimes such as burglary and vandalism. Upon stopping anabolic steroids, some abusers experience symptoms of depressed mood, fatigue, restlessness, loss of appetite, insomnia, reduced sex drive, headache, muscle and joint pain, and the desire to take more anabolic steroids.
- *In injectors*, infections resulting from the use of shared needles or nonsterile equipment, including HIV/AIDS, hepatitis B and C, and infective endocarditis, a potentially fatal inflammation of the inner lining of the heart. Bacterial infections can develop at the injection site, causing pain and abscess.

To encourage youths to avoid anabolic steroid abuse...

- Present a balanced picture of what these drugs can do for them and to them. Most adolescents know that anabolic steroids build muscles and can increase athletic prowess. Research has shown that failure to acknowledge these potential benefits creates a credibility problem and can actually make youths more likely to try the drugs.
- Make use of the authority of coaches and the team ethos. In the most promising program currently under study, coaches and team leaders are trained to educate team members about the effects of anabolic steroid abuse, both desirable and adverse, in the general context of training. They also provide information about nutrition and, of course, exercise and other training techniques for improving performance without the

NIDA's Web site on Steroid Abuse: www.steroidabuse.org

use of anabolic steroids. Assessments of the program suggest that it lowers anabolic steroid abuse by as much as 50 percent and also reduces alcohol abuse among teammates.

- It is uncertain whether drug testing programs can discourage anabolic steroid abuse. However, the first scientific studies of this practice are currently under way.

Anabolic Steroids

For more information about anabolic steroids and other drugs of abuse...

National Clearinghouse for Alcohol and Drug Information (NCADI) Web site www.health.org

- Contact the National Clearinghouse for Alcohol and Drug Information (NCADI) at 1-800-729-6686 or Web site: *www.health.org* for free NIDA publications. For faxed drug abuse information in Spanish and English, call NIDA's INFOFAX line at 1-888-NIH-NIDA or, for those with impaired hearing, 1-888-TTY-NIDA.
- Access NIDA's specialized Web site, *www.steroidabuse.org*. Additional information on other illicit drugs can be accessed through NIDA's home page on the World Wide Web: *www.drugabuse.gov*.

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